

Afrotropical Asilidae (Diptera) 27: Predation of Asilidae by Asilidae

by

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ABSTRACT

Asilidae are commonly preyed upon by other Asilidae. An analysis of 101 predator/prey specimen pairs is reported upon. The results indicate: i. Female asilids are more frequently encountered with asilid prey than males. ii. The average size of the predators is 1.7 times that of their prey, although some were able to overpower prey larger than themselves. iii. The bulk of records involve predators belonging to Apocleinae and Stenopogoninae. iv. Leptogastrinae and Ommatiinae have not been recorded as preying on other asilids. v. Ground-frequenting asilids appear more prone to predation by other asilids; the reason for this may be spatial restriction or high adaptation to feeding on other ground inhabiting insects.

INTRODUCTION

Asilidae are one of the most important groups of predatory insects, especially in arid habitats. They usually attack other flying insects, capturing them with their strong legs and piercing them with their well-developed proboscis. The little that has been published on the predatory behaviour of Afrotropical species has been summarised by Londt (1994).

Information available in an asilid-prey database, maintained at the Natal Museum, indicates that Afrotropical Asilidae commonly capture other asilids and feed on them. Indeed, Asilidae comprised the fourth most commonly preyed upon family of insects, surpassed only by the Acrididae, Formicidae and Scarabaeidae (Londt 1993).

This paper provides a preliminary and brief analysis of available information on Afrotropical asilid predation by other robber-flies and introduces speculative ideas concerning this interesting subject.

MATERIAL AND METHODS

A Natal Museum computer database containing 1608 Afrotropical asilid prey records, including 498 Zimbabwean records published by Hobby (1935), was accessed to establish details concerning asilids implicated in predation of other asilids. As the specific identification of taxa in at least some asilid genera is difficult, and relatively few records are available for most of them, it was decided to confine analysis to the generic level, notwithstanding the possibility that species within a genus could have different prey preferences.

Recent work on Afrotropical Asilidae (Londt 1991 1993; Picker, Leon & Londt 1991) has demonstrated that the size of a prey item can determine the success with which different asilid species are able to prey on it. In an attempt to quantify this factor, length and depth measurements of all available robber flies and their

associated asilid prey, were taken (ie. those in the Natal Museum collection) and analysed. Both the predator and prey were measured (in mm) as follows: length – from tip of proboscis to tip of abdomen (usually measured in two or three sections to accommodate curvature); depth – from distal margin of mesothoracic coxa vertically to top of mesonotum. To facilitate comparisons of differently shaped asilids, a ‘bulk index’ was calculated by multiplying length by depth for both the predators and their prey. This index was first used in studies on *Damalis femoralis* Ricardo (Londt 1991) and subsequently during investigations on the predation of honey-bees by asilids (Londt 1993).

RESULTS AND DISCUSSION

Geographic coverage

Of the 1608 database prey records, 101 involve asilids as prey. Only four African countries are represented – Malawi (2); Namibia (5); South Africa (45); Zimbabwe (49). The Zimbabwe records, with a single exception, are those published by Hobby (1935). A total of 53 records relate to specimens in the Natal Museum collection; these formed the basis for analyses involving the measurement of specimens.

Sex of predator

Of the 101 predators involved, 100 could be sexed (one was broken). The number (and percentage) of males and females was 41 ♂, 59 ♀. This proportion is similar to the overall figures of 36 % ♂ and 64 % ♀ reported for a larger sample of Afrotropical asilid predator/prey records (Londt 1990), and further supports the view that females are more frequently encountered with prey. No sexual breakdown of asilid prey items involved in this study was undertaken.

Size of prey and acceptability

Of the 53 Natal Museum predator/prey associated pairs available for measurement, three were excluded because two prey specimens were incomplete, and one pair could not be traced. The relationship between the size of asilid predators and their asilid prey items, based on 50 measured pairs, is shown in Fig. 1. The average size of the predators (mean bulk index = 143) was 1.7 times that of their prey (mean bulk index = 82). Six (12 %) predators were associated with prey items larger than themselves (those shown below the broken line in Fig. 1) – the most extreme case being a *Neolophonotus* (bulk index 69) which had overpowered a *Daspletis* (bulk index 92) 1.3 times its own size. At the other extreme the smallest prey to be taken relative to the predator's bulk was a *Rhabdogaster* (bulk index 21) which served as food for a *Promachus* (bulk index 159) 7.6 times bigger than its prey.

These results are interesting when compared with the only existing comparable data (i.e. Londt 1991 1993). While asilid predators of other asilids were on average only 1.7 times as big as their prey, Londt (1993) demonstrated that the average bulk index of asilids that captured honey-bees was 152, almost four times the bulk index of honey bees (mean 40). In an earlier study, Londt (1991) demonstrated that the grassland asilid *Damalis femoralis* Ricardo, with a bulk index of approximately 35, feeds on prey with a mean bulk index of about 5 (i.e. they are on average seven times

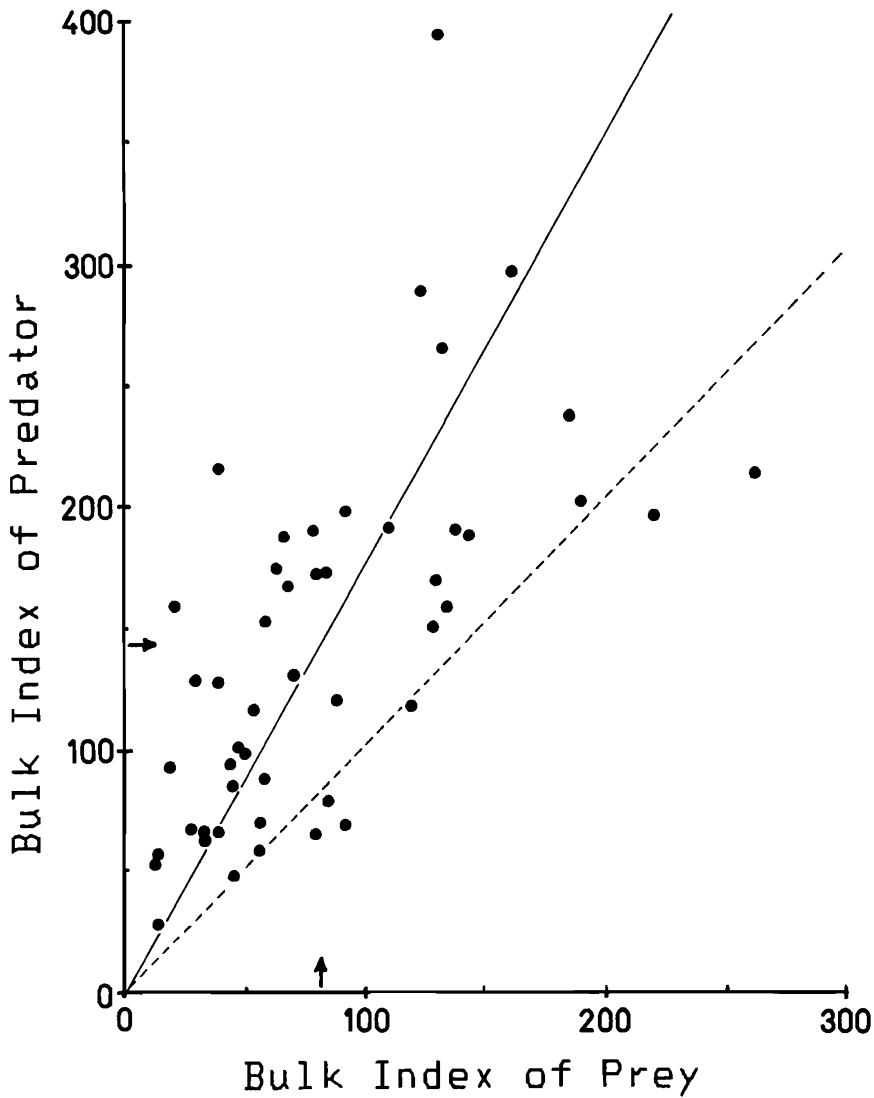


Fig. 1. Size relationship between 50 Afrotropical Asilidae and their asilid prey. The solid line represents the linear relationship between predator and prey size as indicated by a bulk index (i.e. length \times depth), while the broken line indicates the 1:1 relationship. Arrows indicate the average size of predator and prey asilids.

bigger than their prey). It is therefore curious that asilid predators in the present study apparently find it relatively easy to overpower other asilids and to feed on them. A possible explanation is that behavioral factors may put smaller asilid individuals at risk of being overpowered by larger ones. Further mention of this possibility is made in the discussion which follows.

Taxonomic analysis

Details concerning Afrotropical Asilidae known to feed on other asilids are provided in Tables 1–3. A resolution of all data (except for one Hobby record involving an unidentified asilid predator) at a subfamily level is shown in Table 1. While there is a spread of data, the bulk of records involve predators belonging to the Apocleinae (76 % of records) and to a lesser extent the Stenopogoninae (17 %). Asilid groups most commonly involved as prey were the Dasypogoninae (39 % of records) and the Apocleinae (29 %).

TABLE 1

Asilid prey of Asilidae: resolution at subfamily level.
(100 records – therefore actual numbers or percentage).

Predator	Prey									
	Apocleinae	Asilinae	Dasypogoninae	Laphriinae	Laphystiinae	Leptogastrinae	Ommatinae	Stenopogoninae	Stichopogoninae	Trigonimiminae
Apocleinae	24	1	31	5	3	–	–	10	–	2
Asilinae	1	–	–	–	–	–	–	–	–	1
Dasypogoninae	–	–	–	1	–	–	–	1	1	–
Laphriinae	–	–	–	3	–	–	–	–	–	–
Laphystiinae	–	–	–	–	–	–	–	–	–	–
Leptogastrinae	–	–	–	–	–	–	–	–	–	–
Ommatinae	–	–	–	–	–	–	–	–	–	–
Stenopogoninae	4	0	8	2	–	–	–	3	–	–
Stichopogoninae	–	–	–	–	–	–	–	–	–	–
Trigonimiminae	–	–	–	–	–	–	–	–	–	–
Total	29	1	39	11	3	–	–	14	1	2
										100

Tables 2–3, and the following related discussion, focus on analyses of predation by the Apocleinae and Stenopogoninae respectively.

Apocleinae (Table 2):

Of the 76 apocleine predators, *Alcimus* (34 % of sample), *Neolophonotus* (33 %) and *Philodicus* (21 %) account for the majority of records.

Table 2 indicates that *Alcimus* feed predominantly on species of *Pegesimallus* (65 % of records). All these records were reported by Hobby (1935), following a survey in Zimbabwe, and involve one species of *Alcimus* (identified by Hobby as *setifemoratus*) and possibly a single species of *Pegesimallus* (identified as *Neolaparus* sp. by Hobby). As *Alcimus* feeds predominantly on Orthoptera (Hobby 1935, Londt 1994), asilid prey cannot be considered to constitute a major part of their diet. *Alcimus* (especially the group including *setifemoratus*) hunts primarily from open ground (Londt 1994), and has been seen chasing species of Acrididae which settle on open ground. The flight behaviour of *Alcimus* closely resembles that of these acridids. While most *Pegesimallus* species inhabit vegetation (Londt 1994), some species (e.g. *laticornis*) are commonly found resting on open ground (sandy

TABLE 2
Asilid prey of Asilidae: breakdown of 76 Apocleinae
predator records resolved at generic level.

Prey	Predator					Total
	<i>Alcimus</i>	<i>Dasophrys</i>	<i>Neolophonotus</i>	<i>Philodicus</i>	<i>Promachus</i>	
<i>Acnephalum</i>	—	—	—	—	1	1
<i>Afroholopogon</i>	—	—	1	—	—	1
<i>Alcimus</i>	2	—	—	—	—	2
<i>Damalis</i>	—	1	1	—	—	2
<i>Dasophrys</i>	—	1	—	—	—	1
<i>Daspletis</i>	—	—	1	—	—	1
<i>Gonioscelis</i>	1	—	2	—	—	3
<i>Hoplistomerus</i>	1	—	1	1	—	3
<i>Laxenecera</i>	—	—	2	2	—	4
<i>Microstylum</i>	—	—	1	—	—	1
<i>Neolophonotus</i>	—	1	14	—	—	15
<i>Neomochtherus</i>	—	1	—	—	—	1
<i>Pegesimallus</i>	17	1	—	12	1	31
<i>Philodicus</i>	1	—	—	1	—	2
<i>Promachus</i>	3	—	—	—	—	3
<i>Prytania</i>	—	—	1	—	—	1
<i>Rhabdogaster</i>	—	—	—	—	1	1
<i>Scylaticus</i>	—	—	1	—	—	1
<i>Sisyrnodytes</i>	—	—	—	—	1	1
<i>Synolcus</i>	1	—	—	—	—	1
Total	26	5	25	16	4	76
Percentage	34	7	33	21	5	100

paths being much favoured). These facts partly explain why *Alcimus* has been found feeding on *Pegesimallus*.

Philodicus, like *Alcimus*, are also shown to feed mainly on *Pegesimallus*. Again, all these records are those of Hobby from Zimbabwe. The *Philodicus* species involved (*P. swynnertoni* and *P. nigripes*, as identified by Hobby) are also commonly found on the ground, and may well have been feeding on the same species of *Pegesimallus* (identified as *Neolaparus* sp.), for similar reasons as suggested for *Alcimus*. Like *Alcimus*, *Philodicus* feeds primarily on Orthoptera (Londt 1994).

Neolophonotus are shown to feed mainly on asilids of the same genus (Table 2). All supporting data relate to material in the Natal Museum. While all the individuals concerned in the predator/prey pairs have not been specifically identified, only a few of these involve obvious cases of cannibalism (i.e. individuals of the same species). As in the case of *Alcimus* and *Philodicus*, the majority of *Neolophonotus* predators belong to ground-inhabiting species. Indeed, with few exceptions, the prey asilids, both of *Neolophonotus* and other genera (e.g. *Scylaticus*, *Gonioscelis*, *Daspletis*, *Laxenecera* and *Prytania*), are also ground-inhabiting. It appears, therefore, that the majority of apocleine predators involved in this study are ground-inhabiting and, as would be expected, include other ground-inhabiting asilids in their prey.

Stenopogoninae (Table 3):

A generic breakdown of the 17 stenopogonine predators involved in this survey, indicates that all but three belong to the big genus *Microstylum*, which feed primarily

on Coleoptera and Orthoptera (Londt 1994). Of the 14 *Microstylum* predators, 8 (57 %) were paired with *Pegesimallus* prey (5 of these records are those of Hobby while the balance are Natal Museum specimens).

Microstylum species are usually large, free-ranging asilids which feed on a fairly wide variety of prey (Londt 1994). Reasons for the preponderance of *Pegesimallus* in their asilid prey complement are not known. Perhaps a better understanding of the specific behaviours of the species would assist, but this will have to await review of the species and the accumulation of more data.

TABLE 3
Asilid prey of Asilidae: breakdown of 17 Stenopogoninae
predator records resolved at generic level.

Prey	<i>Agrostomyia</i>	<i>Daspletis</i>	Predator <i>Microstylum</i>	<i>Rhacholaemus</i>	Total
<i>Dasophrys</i>	—	—	1	—	1
<i>Microstylum</i>	—	—	2	—	2
<i>Neolophonotus</i>	1	1	—	—	2
<i>Nusa</i>	—	—	2	—	2
<i>Pegesimallus</i>	—	—	8	—	8
<i>Promachus</i>	—	—	1	—	1
<i>Scylaticus</i>	—	—	—	1	1
Total	1	1	14	1	17
Percentage	6	6	82	6	100

Asilidae not known to feed on other asilids

There are no records of predation on other asilids within the subfamilies Laphystiinae, Leptogastrinae, Ommatiinae, Stichopogoninae and Trigonimiminae (Table 1). Indeed, very few prey records of any kind exist for these groups (Londt 1994).

The Stichopogoninae and Trigonimiminae are some of the smallest asilids and therefore would hardly be expected to feed on other Asilidae.

Afrotropical Laphystiinae are represented by only three genera. Records of prey exist for only two of these (Londt 1994): *Trichardis* Hermann contains small species which would not be expected to feed on other asilids, while *Hoplistomerus* Macquart is known to be a specialist on dung-inhabiting insects (Londt 1994).

Leptogastrinae are among the smallest Asilidae and possess a unique general body form. There is also evidence that they may also have rather different predatory behaviour. Londt (1994), based largely on observations of a few *Lasiocnemus*, suggested that members of this subfamily may actively seek specific kinds of prey, as opposed to the majority of asilids which perch at suitable surveillance positions and dart at almost every insect that passes. If this suggestion is valid it would provide at least one explanation for the absence of asilids in the diet of Leptogastrinae.

The little that is known about the behaviour of Ommatiinae suggests that they perch at the tips of twigs, in exposed situations. This often places them well above the ground and makes them reliant on prey flying at that level. Asilids are not usually considered persistent flyers, preferring to perch for long periods, flying only when investigating potential prey or mating partners. For these reasons few asilids would be expected in the diet of Ommatiinae.

CONCLUSIONS

It is clear that many Asilidae frequently encounter and prey on other Asilidae. While this may strengthen any argument which supports the view that adults of at least some asilid species compete for a common food resource, it is also likely that some partitioning of the available food/prey resource takes place. As potential asilid prey items vary in size, and the ability of any one asilid species to capture prey is limited to a specific sector of the total prey community, a variety of asilids, each of a different size, are able to make a living in the same habitat (e.g. open sandy ground). Under these circumstances it is almost inevitable that large asilids would encounter smaller ones and be able to prey on them. The fact that this asilid prey is closely related to the predator, and therefore probably well-equipped to defend itself during aggressive encounters, appears in no way to detract from their acceptability as food. Indeed, evidence already presented suggests that asilids may be more easily captured by larger asilids than some other categories of prey.

Ground-frequenting asilids appear more prone to predation by other asilids than any other group. The majority of asilids found feeding on other asilids also frequent open ground. The most obvious explanation is that such species are spatially restricted, and therefore adapted to feeding on other ground-inhabiting insects. It is also possible that asilids which perch on vegetation and hawk flying prey have quite different responses to other asilids. These are behavioural issues which require further study.

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